It is plain enough that there are serious practical difficulties in the way of such courses. The chief one is in the amount of time required from the instructor for their successful management. It not only requires that the instructor should have a complete acquaintance with his subject, but requires a constant personal supervision and thought, constant variations with different students, and requires that each instructor should plan his own course. A text-book is impossible, for it defeats its own end; or, if one instructor should write a book for his own class, it would be useless for others. Indeed, it is hardly possible to have any definite course; the aim being that each student should be brought in contact with the principles of nature as best suits his own ability, and not that the class as a whole should go over a regular course. Such work is by far the most difficult sort of teaching; and with the present small faculties of many of our colleges, and the inadequate training of many of the professors, it is practically impossible. But happily the faculties are growing larger, and more and more attention is being paid to selecting instructors fitted for their departments by previous training. Fewer hours of recitation-work are demanded, and more time is left to our instructors for thought and personal teaching. In many places can be seen a constant growth of this personal contact of instructor and student, and as fast as it grows we see the routine work of classes replaced by the work of students as individuals.

Along this line, then, we may look for the future development of sciences in the American college. We may hope for an increase in the amount of original investigation; but this must come chiefly from the instructors and graduate students, and it will then serve as an inspiration to the college. We may look for larger laboratories, more apparatus, and greater facilities for practical work on the part of large classes of students; but this will be insufficient unless we see at the same time an increase in the corps of instructors. Our boards of instructors should be large enough to make possible some personal supervision of the students, so that the individual will not become swallowed up in the mass, and large enough to allow to the instructors some time for research, by which means alone they can keep apace with the times. The great demand of higher education in this country is, therefore, not for more colleges or more buildings, but for more money devoted to instruction.

H. W. CONN.

THE FUNCTION AND CONDUCT OF EXAMINATIONS.

THE professors of a German university do not assign the student lessons, or require him to hear lectures. When the time comes to grant or refuse him the degree, their sole sources of information as to his fitness to receive it are, the thesis that he hands in, and the examination to which he is subjected. As respects time, this is a system of unlimited election. That it develops splendid qualities in the student; that it is very grateful to young men who love freedom and hate task-work; and that, together with the other features of the German system, it produces scholars eminent in every branch of scholarship, — are well-known facts. In a German university, stated work is at a minimum, and the examination at a maximum, as a test of proficiency.

At the opposite end of the scale are the primary schools, in the strictest sense of that term. Here no election of work or time can be allowed beyond what extra-school conditions call for. 'Cutting' is absolutely inadmissible. The teacher cannot wait until the end of the term or month, or even day, to discover what the pupil knows: he must prescribe work every day, and, at the beginning, every hour, and then see that the work is done. This is a maximum of lesson, and a minimum of examination.

So far, all is plain and easy. But the moment that we enter the grades of school-work lying between these extremes, we meet a wide difference of opinion, and encounter serious practical difficulties. Here Germany has nothing to teach us. The method of the primary school is then continued to the end of the gymnasium course, when the student plunges at once into the fullest university liberty. The proper end is, rather, progressively to lift the pupil above the task-work level, to give him freedom, and to make him self-reliant. Two opposite tendencies are now very observable in the United States: —

1. A considerable number of colleges are allowing a limited election of time. This means, if a proper regimen is maintained, less dependence upon the daily recitation, and more dependence upon the examination.

2. In the intermediate public-school grades there is a diminishing dependence upon the examination, and an increasing dependence upon the daily work, particularly when the time comes to make the promotions: in fact, this tendency is declaring itself all along the public-school line.

These tendencies are both good; something of the freedom and enthusiasm of the university is finding its way into the college; and there is a manifest slackening of the high public-school tension of a few years ago, that was brought about by the abuse of examinations. Good results may be expected from both these movements.

The adjustment of requirement and election, of stated lessons and examinations, above the primary grades and below the college, or possibly the university, is a problem that every teacher and superintendent will be called upon to solve anew. The elements will vary, and no formula can be given. The solution in a given case will depend upon the facts that condition the home, the school, and even the individual pupil. It is often urged against examinations that they promote cramming. Teachers who have to solve this problem will do well to remember that they also tend to prevent cramming. Pupils cram for the daily recitation as well as for the examination; and as the daily recitation tends to check cramming for the one purpose, so the examination tends to check it for the other purpose.

B. A. HINSDALE.

I AM asked to write a very brief article on the function and conduct of examinations. By examinations is meant a formal set of questions answered in writing. Among the useful purposes which can be subserved by such tests are the following: —

1. They may serve as a stimulus or incentive to study. Students who know that at some period of their work they will be required to give written answers to questions based on the work done are likely to be more attentive, industrious, and interested in their work.

2. They encourage thoroughness. Those who prepare for an oral recitation may depend upon chance, or artifice, or favoritism, to help them through; but a searching examination, calling for exact written statements, is another matter, and demands better preparation.

3. They afford an opportunity, in some instances, for a review of the whole subject passed over during the term.

4. They are often valuable as an exercise in English composition, calling as they do for clear, concise, comprehensive statements.

5. They are a revelation to the pupils of their own ability and attainments, as well as of their weakness and defects.

6. They call for concentration of mind, sustained mental effort, and a ready use of one's resources, which is a valuable educational discipline.

7. They reveal to the teacher the results of his teaching, the failure or success of his methods, and thus afford an opportunity of modifying his work when necessary.

8. The tabulated results of a series of examinations, extending through several months or years, indicate with considerable certainty the student's trend of mind, habits of study, and scholarly development. These results are specially valuable to parents in deciding what is best for their children.

9. The results are helpful to superintendents and others in forming an opinion of the progress of the pupils, and the work of the teacher.

10. They give to school-work a kind of dignity, increase the student's self-respect, and impart to the teacher's mind a judicial habit, freeing him from the great tendency to judge of his pupils by sentimental regard rather than by a critical judgment.

With these ends in view, how shall the examinations be conducted?

1. They should be an ordinary, and not an extraordinary, part of school machinery. If they are held only at the close of a term, or at the conclusion of a study, the students should be prepared for them by the character of the daily recitation, and by occasional

written recitations, and 'tests,' which resemble the written examinations, but are less severe.

2. The purpose and method of the examination should be fully explained to the pupils, and their mistakes and failures should be pointed out.

3. The questions set should be adapted to the age and ability of the pupils, easy enough to encourage them to attempt all, and difficult enough to call for their best efforts; should pertain to the work actually done; should be explicit, concise, logical, and call for thought and a mastery of principles, as well as for memory.

4. Too much importance should not be attached to the results. They should be reckoned as only one element, among several, in determining the standing of the student, and his fitness for promotion or graduation. They should never be made the basis of ranking, or the sole ground of promotion.

5. They should always be regarded and treated as simply one means or device in the process of education, and should never be treated as if they were the goal to be gained. They are a means, and not an end.

6. They should not be so severe or prolonged as to overtax the students' powers, should be conducted with absolute fairness and impartiality, as well as with good sense in regard to time, place, and circumstances, and proper allowance should be made for any exceptional circumstances, such as illness on the part of the student. The 'final' examination should be held long enough before the close of the term to allow the teacher to make the proper use of the results before the class separates.

THOMAS J. MORGAN.

IN the current discussions on the use and the abuse of examinations, it seems frequently to be assumed that their one great purpose is to test, — to furnish a basis for estimating the pupil's knowledge and ability, and the teacher's skill and success in instruction. If this were really the only purpose they serve, it would be easy to justify them, notwithstanding the fact that some evils undoubtedly flow from them. These evils do not exist in examinations *per se*, but are faults of administration; and, if a teacher proposes to abolish them on the ground that they encourage immorality, he utters an indictment of his own professional skill.

But admit, with certain extremists, that examinations have no justifiable use as tests; that, for example, a pupil's fitness for promotion, or for learning a subject, is best determined by the teacher's personal knowledge, without any formal test: even then the examination can hold its ground, regarded either as a motive or as a discipline.

I feel sure that my experience in the management of public schools has taught me that the intellectual tone of a school cannot be kept at the proper pitch by any other motive. Even the best of pupils need to feel that they must study with a view to rendering a formal account of their opportunities. Here, again, the stress may be too great; but this is simply a fault of administration, which is a direct reflection on professional skill.

But leaving also the motive power and value of examinations out of account, they have a third and adequate defence in the fact that they afford a discipline of incomparable quality. The ability to render a clear, exact, and comprehensive account of what we know on a given subject, under some stress, or in view of something important depending on the result, is an endowment of supreme importance; and I know of no instrument for this purpose save a judicious examination.

As it seems to me, the only debatable question in the case is that of use and abuse: it is simply a matter of administration.

W. H. PAYNE.

THE purpose of all education must be the development of thought and character in the widest sense of these terms, — "the generation of power."

Examinations are of use only in so far as they are in harmony with this general purpose. They are a great power for good or evil; they may be made a blessing or a curse to schools. An examination of pupils conducted by a supervising officer should have a threefold aim: —

First, It should be made a test as far as the pupils are concerned. Right here comes the danger of all examinations. What shall the test be? Quantity of knowledge? Then 'cramming' will be the inevitable result; and the superintendent who thus plants thorns and thistles has no right to expect them to bring forth grapes and figs.

The examination must test power, and not mere quantity of knowledge, — power to do intellectual work. As all food that is eaten is not converted into physical force, so all knowledge acquired is not converted into mental power. The test-question in the former case is, not "How much have you devoured?" nor even "How much do you weigh?" but "How much can you lift?" So in the latter case it must be, not "How much do you remember?" but "How much can you do?"

The examination, therefore, should not require a mere reproduction of what the pupil has learned, but it should test his power of dealing with new questions and problems closely allied in principle to those which he has studied.

Secondly, It should stimulate the pupil to work in right lines. The pupil will work for the examination, and it is right that he should. If by working for it his work is wrong, the fault lies with the examiner and the examination. A superintendent has it in his power in this way to direct, in a large measure, the study of all the pupils in his schools.

Thirdly, It should test the character of the teaching, and should direct the work of the teacher. The teacher, like the pupil, will work for the examination to a very large extent. That which is made the chief test in the examination will be the motive of work with both teacher and pupil.

The examination is therefore a powerful lever, in the hands of a competent superintendent, to force school-work into right lines.

THOMAS M. BALLIET.

THE ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS.

THE fourth annual meeting of this Association was held in the Library of the Department of Agriculture, Washington, beginning Aug. 16, and lasting three days. The president, Dr. E. H. Jenkins of Connecticut, in his opening address, congratulated the Association on the success which had attended its efforts in securing the adoption of uniform methods for the analysis of fertilizers. He also recommended that the Constitution of the Association be amended so as to include chemists of agricultural colleges, and all official chemists having control of fertilizers, dairy products, and agricultural products in general.

The first business of the session, after listening to the President's address, was the reception of the report of the committee on fodders and feeding-stuffs, of which Prof. G. C. Caldwell of Cornell was chairman. The committee had sent out a number of samples of fodders and feeding-stuffs for comparative analysis, and the results obtained were presented. They showed that in the same sample widely different results were obtained by different analysts. These variations showed the necessity of adopting a strictly uniform method of analysis. Such a scheme was reported by the committee, and, after discussion and amendment by the Association, was adopted to be used by all analysts connected with the Association during the coming year.

The report of the committee on dairy products was presented by Dr. H. W. Wiley of Washington. The committee had sent out various samples of butters and butter-substitutes for examination by members of the Association. The tabulation of the analyses, as in the preceding cases, showed wide variations in many particulars. After discussion and amendment, the following method of analysis for butter and milk was adopted. For butter, preliminary examination with polarized light and selenite plate was recommended, while it was stated that the melting of butters and butter-substitutes, and their subsequent examination after cooling by polarized light, appeared to have no value as means of qualitatively sorting butters and butter-substitutes. The method of determining the specific gravity of the butter-fat at 40° C., in a picnometer, was adopted. For Reichert's method, the saponification is to be made in the flask to be used subsequently in the distillation, saturated solution of potash with a small amount of alcohol to be used, and the fat-acids subsequently to be freed by phosphoric instead of sulphuric acid.